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Page 1 of: 33

Attention: MAIL STOP APPEAL BRIEF - AF
Group Art Unit 2617
Examiner Pierre Louis Desir

From: SMART & BIGGAR

Your file no.: 10/682,090

Reply to Ottawa file no.: 77682-211

Date: February 1, 2007

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TRANSMITTAL OF APPEAL BRIEF (Large Entity)	Docket No. 77682-211 /slr

In Re Application Of: ADRIAN DAVID SMITH, ET AL

Application No.	Filing Date	Examiner	Customer No.	Group Art Unit	Confirmation No.
10/682,090	October 10, 2003	Pierre Louis Desir	07380	2617	9202

Invention: SYSTEM AND METHOD OF OPERATION OF AN ARRAY ANTENNA IN A DISTRIBUTED WIRELESS COMMUNICATION NETWORK

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appl. No.	:	10/682,090	Confirmation No. 9202
Applicant	:	Adrian David Smith, et al	
Filed	:	October 10, 2003	
TC/A.U.	:	2617	
Examiner	:	Desir, Pierre Louis	
Docket No.	:	77682-211	
Customer No.	:	07380	

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RESPONSE AFTER FINAL
EXPEDITED HANDLING REQUESTED

Commissioner for Patents
Alexandria, VA 22313-1450
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Dear Sir:

APPELLANT'S BRIEF UNDER 37 C.F.R. 41.37

The following is the Appellant's Brief, submitted under the provisions of 37 C.F.R. 41.37. The fee of $500 that is required by 37 C.F.R. 41.20(b)(2) for filing a brief in support of the appeal is enclosed.

Real Party in Interest

The real party in interest is the assignee of record, i.e. Nortel Networks Limited, current address 2351 Boulevard Alfred-Nobel, St. Laurent, Quebec, Canada, H4S 2A9.

Related Appeals and Interferences

There are no related appeals or interferences that will directly affect, be directly affected by, or have a bearing on the present appeal.

Status of the Claims

Claims 1-35 are currently pending in the application and are appealed herein.

An Appendix containing a copy of the appealed claims is attached hereto.

Status of Amendments

No amendments were filed subsequent to the Final Action of September 19, 2006.

Summary of the Claimed Subject Matter

The following summary refers to the primary illustrative embodiment disclosed in Appellant's specification for the purpose of compliance with 37 C.F.R. § 41.37(c)(v), and is not intended to limit the scope of the pending claims.

References to the "Specification" refer to the specification as originally filed on October 10, 2003.

a. Independent Claim 1

According to a broad aspect, independent claim 1 relates to "A system for operating an array antenna having a plurality of antenna elements". An example of such a system, which is an embodiment of the present invention, is illustrated in Figure 4 and is described in the Specification in detail starting at page 14, line 18 to page 15, line 26. In Figure 4, an example of such an array antenna is identified by reference character 80. In Figure 4, examples of the antenna elements are identified by reference character 82.

In claim 1, the system is recited to include a "feeding port". An example of such a feeding port is identified by reference character 94 and is described at page 14, line 22.

In claim 1, the system is recited to include a "a plurality of signal shifters for respective connection to the plurality of antenna elements". Examples of such signal shifters are identified

by reference characters 84, 86, 88, 90 and are described in the Specification starting at page 14, line 23 to page 15, line 9.

In claim 1, the system is recited to include "an adaptive beamformer configured to distribute input signals from the feeding port to the plurality of signal shifters and to combine output signals from the plurality of signal shifters for output to the feeding port in a plurality of operating modes". An example of such a beamformer is identified by reference character 92 and is described in the Specification starting at page 14, line 23 to page 15, line 26.

Claim 1 also includes the limitation that "the plurality of operating modes being associated with respective array antenna gain patterns having different beamwidths." The plurality of operating modes is described in the Specification at page 19, lines 23-31 as follows:

> Thus, an array antenna operated in this manner has configurable beamwidth. A wide beamwidth operating mode is useful for such functions as scanning or listening for incoming communication traffic or link requests. The high gain directional or narrow beamwidth operating mode for communication functions simultaneously increases received signal power and reduces interference. Both operating modes are provided using a single antenna structure and phase shifters.

b. Independent Claim 15

According to another broad aspect, independent claim 15 relates to a "network node for a distributed wireless network". An example of a network node is shown in Figure 2 by reference character 14 and is described in the Specification starting at page 10, line 17 to page 12, line 30. An example of a distributed wireless network is shown in Figure 1 and is described in the Specification starting at page 9, line 24 to page 11, line 9.

In claim 15, the network node is recited to include a "a steerable array antenna having a plurality of antenna elements and configurable beamwidth for establishing wireless transit radio links with neighbouring network nodes in the distributed wireless access network".

In Figure 2, an example of a "steerable array antenna" is identified by reference character 52.

In Figure 4, examples of the antenna elements are identified by reference character 82.

The limitation of the steerable array antenna having "configurable beamwidth for establishing wireless transit radio links with neighbouring network nodes in the distributed wireless access network" is described in the Specification at page 19, lines 23-31.

In claim 15, the steerable array antenna is also recited to include "a plurality of signal shifters for respective connection to the plurality of antenna elements." Examples of such signal shifters are identified by reference characters 84, 86, 88, 90 and are described in the Specification starting at page 14, line 23 to page 15, line 9. The connection between the signal shifters and the antenna elements is shown in Figure 4.

In claim 15, the steerable array antenna is also recited to include: "an adaptive beamformer for distributing array antenna input signals to the plurality of signal shifters and combining array antenna output signals from the plurality of signal shifters in at least a wide beamwidth operating mode associated with an array antenna gain pattern having a first beamwidth and a narrow beamwidth operating mode associated with an array antenna gain pattern having a second beamwidth narrower than the first beamwidth."

An example of such a beamformer is identified by reference character 92 and is described in the Specification starting at page 14, line 23 to page 15, line 26. A "wide beamwidth operating mode" is described in the Specification at page 19, lines 23-31. A "narrow beamwidth operating mode" is described in the Specification at page 19, lines 23-31. Actual representative examples of various beamwidth operating modes are illustrated in Figures 8 (62 degrees), Figure 9 (34 degrees), Figure 10 (13 degrees), Figure 11 (7 degrees), and Figure 12 (4 degrees).

c. Independent Claim 20

According to another broad aspect, independent claim 20 relates to a "A method of operating an array antenna in a wireless communication network, the array antenna having

configurable beamwidth." Page 19, line 23 of the Specification provides that "Thus, an array antenna operated in this manner has configurable beamwidth."

The method of claim 20 recites the step of "listening for communication requests using a first beamwidth of the array antenna". Page 19, lines 24-26 of the Specification provides "A wide beamwidth operating mode is useful for such functions as scanning or listening for incoming communication traffic or link requests."

The method of claim 20 further recites the steps of:

i. receiving a communication request identifying a destination wireless access routing point in the wireless communication network"

ii. "forming a beam having a second beamwidth narrower than the first beamwidth"

iii. directing the formed beam toward the destination wireless access routing point

iv. transmitting communication signals over the formed beam to the destination wireless access routing point

Page 18, lines 22 to 26 of the Specification provide:

> "For communication operations, a more directional antenna pattern is generally preferred to increase received signal power and reduce interference. When a transit link request from a neighbouring WARP or a communication signal from a mobile station within an access area of a WARP is received, for example, a high gain directional operating mode is preferably selected."

See also page 21, lines 9 to 17 of the Specification which provide:

> The array antenna operation techniques described above use a wide beamwidth for scanning or listening, to locate a source of incoming communication traffic, and a narrow beamwidth for sending or receiving traffic. A wide beam locates a source, and then antenna

gain is effectively steered towards the source or to a destination for transmission operations.

d. Independent Claim 29

According to another broad aspect, independent claim 29 relates to "a system for operating an array antenna element in a wireless communication network". An example of such a system which is an embodiment of the present invention is illustrated in Figure 4 and is described in detail in the Specification starting at page 14, line 18 to page 15, line 26. In Figure 4, examples of array antenna elements are identified by reference character 82. An example of a wireless communication network is shown in Figure 1 and is described in the Specification starting at page 9, line 24 to page 11, line 9.

Independent Claim 29 includes four means-plus-function phrases as follows:

d1. "means for exciting the array antenna to form a beam having a first beamwidth to listen for communication requests;

d2. means for receiving a communication request identifying a destination wireless access routing point in the wireless communication network;

d3. means for exciting the array antenna to form a beam having a second beamwidth narrower than the first beamwidth, and for directing the formed beam toward the destination wireless access routing point; and

d4. means for transmitting communication signals over the beam having the second beamwidth to the destination wireless access routing point.

The structure with respect to each of the above will now be described with reference to the specification by page and line number, and to the drawings, if any, by reference characters.

d1. "means for exciting the array antenna to form a beam having a first beamwidth to listen for communication requests;

In one embodiment, the structure with respect to the phrase "means for exciting the array antenna" in d1 is feeding port 94 illustrated in Figure 4. At page 15, lines 4-6 of the Specification it is stated:

> During a transmit operation, the beamformer 92 distributes an excitation signal received on the feeding port 94 to the phase shifters 84, 86, 88, and 90.

With regard to the phrase "a first beamwidth to listen for communication requests", see page 19, lines 24-26 of the Specification which provides "A wide beamwidth operating mode is useful for such functions as scanning or listening for incoming communication traffic or link requests."

d2. means for receiving a communication request identifying a destination wireless access routing point in the wireless communication network

In one embodiment, the structure with respect to the phrase "means for receiving a communication request" in d2 is antenna radiating element 82 shown in Figure 4. Page 14, lines 20-21 of the Specification provides:

> The patch array antenna 80 includes a plurality of radiating elements 82 arranged in 4 rows and n + 1 columns.

With regard to the phrase "identifying a destination wireless access routing point in the wireless communication network", see page 18, lines 22 – 31 of the Specification which provide:

> When a transit link request from a neighbouring WARP or a communication signal from a mobile station within an access area of a WARP is received, for example, a high gain directional operating mode is preferably selected. For a transit link request, an identifier of the requesting WARP is decoded from the request, and a previously generated lookup table or other mapping means from

which the phase weights associated with steering a beam toward neighbouring WARPs can be retrieved or determined is accessed.

d3. means for exciting the array antenna to form a beam having a second beamwidth narrower than the first beamwidth, and for directing the formed beam toward the destination wireless access routing point;

In one embodiment, the structure with respect to the phrase "means for exciting the array antenna to form a beam ..." in d3 is beamformer 92 and phase shifters 84, 86, 88 and 90 shown in Figure 4. See page 14, line 25 to page 15, line 26 of the Specification.

With regard to the phrase "second beamwidth narrower than the first beamwidth, and for directing the formed beam toward the destination wireless access routing point", page 18, lines 22 to 26 of the Specification provide:

> "For communication operations, a more directional antenna pattern is generally preferred to increase received signal power and reduce interference. When a transit link request from a neighbouring WARP or a communication signal from a mobile station within an access area of a WARP is received, for example, a high gain directional operating mode is preferably selected."

See also page 21, lines 9 to 17 of the Specification which provide:

> The array antenna operation techniques described above use a wide beamwidth for scanning or listening, to locate a source of incoming communication traffic, and a narrow beamwidth for sending or receiving traffic. A wide beam locates a source, and then antenna gain is effectively steered towards the source or to a destination for transmission operations.

d4. means for transmitting communication signals over the beam having the second beamwidth to the destination wireless access routing point

In one embodiment, the structure with respect to the phrase "means for transmitting communication signals" in d4 is antenna radiating element 82 shown in Figure 4. Page 14, lines 20-21 of the Specification provides:

> The patch array antenna 80 includes a plurality of radiating elements 82 arranged in 4 rows and n + 1 columns.

With regard to the phrase "over the mean having the second beamwidth to the destination wireless access routing point", see page 21, lines 9 to 17 of the Specification.

e. Independent Claim 30

According to another broad aspect, independent claim 30 relates to a "distributed wireless network". An example of a distributed wireless network is shown in Figure 1 and is described starting at page 9, line 24 to page 11, line 9 of the Specification.

Claim 30 further recites a "a plurality of network access nodes". One example of a plurality of access nodes is shown in Figure 1 and identified by Network Access Point 10, and WARPs 14, 14, 20, 22 and 24. See page 9, line 24 to page 11, line 2 of the Specification.

Claim 30 further recites "a plurality of wireless transit radio links between the network access nodes". Examples of wireless transit radio links are shown in Figure 1 and identified by reference characters 26, 28, 30, 31, 32, 34, 36, 38 and 40. See page 10, lines 4 and 5 of the Specification.

Claim 30 further recites "wherein at least one of the network access nodes comprises an electronically steerable high gain array antenna with configurable beamwidth for establishing wireless transit links with neighbouring network access nodes."

In Figure 2, an example of a "electronically steerable high gain array antenna" is identified by reference character 52. The concept of configurable beamwidth is described at page 19, lines 23-31 of the Specification as follows:

> Thus, an array antenna operated in this manner has configurable beamwidth. A wide beamwidth operating mode is useful for such

functions as scanning or listening for incoming communication traffic or link requests. The high gain directional or narrow beamwidth operating mode for communication functions simultaneously increases received signal power and reduces interference. Both operating modes are provided using a single antenna structure and phase shifters.

Grounds of Rejection to be Reviewed on Appeal

The grounds of rejection presented for review are as follows:

(i) whether claims 1-4, 12-13, 15-16, 30, and 32-35 are unpatentable under 35 U.S.C. §103(a) over Munoz-Garcia et al., U.S. Patent No. 6,340,948 (hereinafter "Munoz-Garcia"), in view of Gross et al., U.S. Patent No. 6,307,507 (hereinafter "Gross");

(ii) whether claim 5 is unpatentable under 35 U.S.C. §103(a) over Munoz-Garcia and Gross in further view of Jespersen, Pub. No. US 20030236068;

(iii) whether claim 6 is unpatentable under 35 U.S.C. §103(a) over Munoz-Garcia and Gross in further view of Livingston et al. (hereinafter "Livingston"), U.S. Patent No. 6,388,631;

(iv) whether claims 7-11, 14, 17-25, 27 are unpatentable under 35 U.S.C. §103(a) over Munoz-Garcia and Gross, in further view of Kasami et al. (hereinafter "Kasami"), U.S. Patent No. 6,400,318;

(v) whether claim 26 is unpatentable under 35 U.S.C. §103(a) over Munoz-Garcia, Gross and Kasami in further view of Yu, U.S. Patent No. 6,661,366 (hereinafter "Yu"); and

(vi) whether claim 31 is unpatentable under 35 U.S.C. §103(a) over Munoz-Garcia, Gross and Kasami in further view of Berger et al., U.S. Patent No. 6,426,814 (hereinafter "Berger");

Arguments

(i) Whether claims 1-4, 12-13, 15-16, 30, and 32-35 are unpatentable under 35 U.S.C. §103(a) over Munoz-Garcia in view of Gross

a. Munoz-Garcia and Gross are not Analogous Prior Art

According to the Manual of Patent Examining Procedure (the "MPEP"), Section 2141.01, only analogous prior art may be cited under 35 U.S.C. 103. The analogous-art test requires that a reference is either in the field of the applicant's endeavor or is reasonably pertinent to the problem with which the inventor was concerned in order to rely on that reference as a basis for rejection. *In re Oetiker*, 977 F.2d 1443, 1447 (Fed. Cir. 1992). References are selected as being reasonably pertinent to the problem based on the judgment of a person having ordinary skill in the art. Id.

For an application of this principle in the electrical arts to which the invention of the present application under appeal is concerned see, *Wang Laboratories, Inc. v. Toshiba Corp.*, 993 F.2d 858, 26 USPQ2d 1767 (Fed. Cir. 1993) where patent claims were directed to single in-line memory modules (SIMMs) for installation on a printed circuit motherboard for use in personal computers. Reference to a SIMM for an industrial controller was not necessarily in the same field of endeavor as the claimed subject matter merely because it related to memories. Reference was found to be in a different field of endeavor because it involved memory circuits in which modules of varying sizes may be added or replaced, whereas the claimed invention involved compact modular memories. Furthermore, since memory modules of the claims at issue were intended for personal computers and used dynamic random-access-memories, whereas reference SIMM was developed for use in large industrial machine controllers and only taught the use of static random- access-memories or read-only-memories, the finding that the reference was nonanalogous was supported by substantial evidence.

For the reasons that follow, Applicant submits that due to their non-analogous nature, a person of ordinary skill in the art would not have combined the Munoz-Garcia and Gross

references to arrive at the claimed invention.

It is noted both Munoz-Garcia and Gross are classified in class 342/363, i.e. Communications: Directive Radio Wave Systems and Devices (E.G., Radar, Radio Navigation), including a steerable array, with a matrix. By contrast, the present application is classified under class 455/562.1, i.e. Telecommunication equipment, Radiotelephone equipment detail, base station detail, having specific antenna arrangement.

However, the Munoz-Garcia and Gross references cannot be considered to be within the Applicant's field of endeavour merely because the cited references and the claimed invention all relate to telecommunications.

While Applicant accepts that USPTO classifications are only some evidence of the extent to which different arts are or are not analogous, this distinction in classifications underlies the significant difference between the prior art and the present application: namely that the antenna systems of <u>both prior art patents</u> relate to satellite-based antenna systems, whereas the antenna system of the present application relates to a terrestrial telecommunications system. As such, they are directed to different purposes and solutions to address quite different environmental and operating parameters.

Satellite antenna systems are "designed to transmit and receive an array of multiple beams, each directed toward of the surface of the Earth" (Munoz-Garcia, column 1, lines 13-15), such satellites being in "intermediate circular orbits (ICO), at a height, for example of 10,000 km above the Earth" (Munoz-Garcia, column 4, lines 1-3). Satellite antenna systems can also be used on satellites in "low-earth orbit (LEO), medium-earth orbit (MEO), high-earth orbit (HEO), or geosynchronous orbit (GEO). By contrast, the telecommunications antenna of the present application is described in one embodiment as being used in a "distributed wireless communication network with a network access point, a plurality of wireless access routing points and a plurality of wireless transit links." (Specification, page 9, line 24 – page 10, line 5).

As noted above, the problems faced by a person skilled in the art of antenna design for orbiting satellites are different from those faced by a skilled person in the art of terrestrial telecommunications antenna design. For example, satellite receivers generally require

unobstructed line of sight to the satellite, whereas this is not the case with terrestrial antenna systems. Similarly, the design of a return channel for a satellite telecommunications system is altogether different than a return channel in a terrestrial telecommunications system.

Furthermore, in both Munoz-Garcia and Gross there is a discussion of the weight and power consumption limitations present on satellites. Indeed, these are admitted to be the prime motivations for the array antenna of Munoz-Garcia and the multi-mode antenna of Gross. However, weight and power consumption in space are of course not prime considerations in the design of a terrestrial telecommunications system. The same holds true for the considerable extremes of temperature and radiation exposure arising from orbit around the Earth.

In the Final Action, the Examiner has indicated that the above argument is not persuasive because "both references are in the Applicant's endeavour and reasonably pertinent to the particular problem with which the applicant was concerned (i.e. system and method of operation of array antenna in a communication network"). In response, Applicant refers to the Background of the Invention, Specification page 3, line 21 – page 4, line 29 which sets forth the problems associated with conventional terrestrial communications systems which the invention is intended to solve. For the convenience of the Board, this section is reproduced in its entirety below:

> In wireless communication networks, the capacities of wireless communication links between network nodes are dependent upon received signal power relative to noise and interference, often expressed as a signal to noise and interference ratio or SNIR. Received signal power is affected by such link characteristics as link length and physical obstructions or "shadowing".
>
> Directional antennas are commonly used to mitigate the effects of shadowing. However, antennas are often deployed in constrained locations such as on street lights, utility poles, and the like, and are therefore limited in size. Size limitations in turn limit the directionality of these antennas, which thereby renders the antennas more susceptible to interference.

> Although conventional high gain directional antennas may increase received signal power, known manual alignment techniques by which such antennas are aligned with existing network nodes are labor intensive. For example, when a network node is added to a communication network, a new antenna may need to be added to and aligned at each existing network node with which the new network node is to communicate. Alternatively, a high gain antenna need not necessarily be implemented at both ends of each transit link between network nodes, but such transit links then do not fully derive the benefits of high gain directional antennas.
>
> Further, high gain directional antennas, by their nature, are characterized by narrow radiation and reception patterns or beams. Beamwidth generally decreases with increasing gain. Whereas highly directional beams may improve SNIR and increase wireless link capacity, scan times to detect incoming communication signals from neighbouring network nodes tend to increase, particularly for network nodes that communicate with multiple other network nodes. For these nodes, a greater number of antennas are required to cover a full 360 degrees, and each antenna is typically scanned to detect incoming communications.

Applicant submits that the problems of shadowing, difficulties of deployment, size limitations, and manual alignment as set forth in the excerpt above are simply not pertinent in connection with a satellite communication system. It is also noted that <u>neither</u> of the references cited by the Examiner are in respect of terrestrial communications systems.

In view of the foregoing, Applicant therefore submits that the prior art is from a different field of endeavour from that claimed and is not reasonably pertinent to the problem faced by the Applicant. Applicant therefore requests that the Examiner withdraw the citations of Munoz-Garcia and Gross.

b. No Motivation to Combine Munoz-Garcia and Gross to Arrive at Claimed Invention

Turning now to the question of motivation to combine, Applicant submits that the Examiner has failed to satisfactorily explain why one of ordinary skill in the art at the time the invention was made would have been motivated to make the proposed modification. The MPEP, Section 2143.01, sets out three possible sources of motivation to combine, namely: the nature of the problem to be solved, the teachings of the prior art, and the knowledge of persons of ordinary skill in the art. It is respectfully submitted that the Examiner has not established a motivation to combine the references from any one of the three sources.

With regard to claim 1, the Examiner alleges that Munoz-Garcia discloses the majority of the features of this system claim. However, the Examiner states that Munoz-Garcia does not specifically disclose a system with a plurality of operating modes being associated with respective array antenna gain patterns having different beam widths. The Examiner alleges that Gross discloses a system wherein a plurality of operating modes being associated with respective array antenna gain patterns having different beam widths (i.e., the phase antenna array could be enabled to operate in a mode having a broad, lower power, low bandwidth beam and could also be enabled to operate in a mode having narrow width beams). The Examiner has further alleged that a motivation for combining both teachings would have been "to provide a system wherein a single antenna may be used to generate a large number of beams, with improved beam coverage and reduced dropoff (Munoz-Garcia, col. 3 lines 16-19).

Using a cascade of Butler matrix devices, Munoz-Garcia describes a satellite based array antenna which transmits a plurality of phase shifted beams towards the Earth for improved beam coverage. As noted by the Examiner, Munoz-Garcia does not specifically disclose a system with a plurality of operating modes being associated with respective array antenna gain patterns having different beam widths.

Applicant directs the Board's attention to the entirety of the paragraph in Munoz-Garcia from which the Examiner has quoted as the source for the motivation to combine:

> Thus, a single antenna can be used to generate a large number of

> beams, with improved beam coverage and reduced dropoff between beams as compared to a beam array producible from a single Butler matrix device.

Applicant submits that the above statement in Munoz-Garcia quoted by the Examiner does not provide the requisite motivation to combine with Gross. More specifically, there is nothing in the sentence quoted by the Examiner that relates to a motivation to provide a multi-mode of operation as set forth in Gross. The above statement is nothing more than a summary of the result of the operation of the Munoz-Garcia invention (i.e., "a large number of beams, with improved beam coverage and reduced dropoff between beams as compared to a beam array producible from a single Butler matrix device").

There is no explicit reference in Munoz-Garcia to multiple operating modes. This is conceded by the Examiner.

Applicant appreciates that a suggestion, teaching, or motivation to combine the relevant prior art teachings does not have to be found explicitly in the prior art. However, the test for an implicit showing is what the combined teachings, knowledge of one of ordinary skill in the art, and the nature of the problem to be solved as a whole would have suggested to those of ordinary skill in the art: *In re Kotzab*, 217 F.3d 1365, 1370 (Fed. Cir. 2000). In this case, the problems facing the inventor were those set forth in the Background of the Invention, excerpted above. Some of these included the problems of shadowing, difficulties of deployment, size limitations, and manual alignment. Applicant submits that Munoz-Garcia, being directed at a satellite based array antenna for improved beam coverage, is not at all directed to these problems and therefore a person of ordinary skill in the art, possessed with the understandings and knowledge reflected in the prior art, and motivated by the general problem facing the inventor, would not have been led to make the combination recited in the claims.

Therefore, Applicant submits that the source of the motivation to combine identified by the Examiner is not proper and should be disregarded.

Applicant now turns to the three sources for a motivation to combine under MPEP, Section 2143.01.

With regard to the first source for a motivation to combine, Applicant submits that the nature of the problem to be solved is not the same in the two references. While the antenna system in Munoz-Garcia is directed to the generation of a regularly angularly dispersed array of simultaneous radiation beams from an antenna array, Gross is directed towards operating a single phased-array antenna on a satellite based communications node in more than one mode. Applicant submits that these are directed to different problems.

With regard to a second source for a motivation to combine, Applicant submits that neither of the two pieces of cited art suggest the subject matter of the other piece of prior art in a manner that would lead one skilled in the art to arrive at the claimed invention by a review of the two references. First, neither reference refers to the other. Furthermore, the respective prior art does not suggest, either alone or in combination the desirability of the claimed invention. As clearly stated in *In re Kotzab*, 55 USPQ2d 1313, 1318 "Identification of prior art statements that, in abstract, appear to suggest claimed limitation does not establish prima facie obviousness without a finding as to specific understanding or principle within knowledge of skilled artisan that would have motivated one with no knowledge of invention at issue to make combination in manner claimed". Applicant submits that the Examiner has combined the teachings of Munoz-Garcia (which deal with the generation of a regularly angularly dispersed array of simultaneous radiation beams from a satellite-based array antenna) with wholly unrelated teachings of Garcia (dealing with multi-mode operations of a satellite-based array antenna) to arrive at the claimed invention. Applicant submits that there is no teaching whatsoever in Munoz-Garcia to suggest that a multi-mode operation was even contemplated, let alone desirable.

With regard to the third source for a motivation to combine, Applicant submits that the Examiner has failed to show motivation based on the knowledge of persons of ordinary skill in the art. The Examiner does not provide any clear indication of the particular knowledge that one skilled in the art would have at the time of the invention for combining Munoz-Garcia and Gross, especially in view of the fact that, as noted above, Munoz-Garcia deals with the generation of a regularly angularly dispersed array of simultaneous radiation beams from a satellite-based array antenna and Gross deals with multi-mode operations of a satellite-based array antenna which are two wholly unrelated concepts.

In re Fine, 5 USPQ2d 1596, 1600 also has established the clear requirement for an objective teaching or generally available knowledge that would lead one skilled in the art to combine teachings of existing references. Reference is made to *W.L. Gore* 721 F.2d at 1553 : "To imbue one of ordinary skill in the art with knowledge of the invention in suit, when no prior art reference or references or record convey or suggest that knowledge, is to fall victim to the insidious effect of a hindsight syndrome wherein that which only the inventor taught is used against its teacher." Applicant submits that this is what the Examiner has done in the present case by combining two satellite-based antenna systems which are wholly unrelated to each other to allegedly produce the claimed invention.

It is further well established that the fact that a reference can be combined is not sufficient to establish prima facie obviousness. Although a prior art device "may be capable of being modified to run the way the apparatus is claimed, there must be a suggestion or motivation in the reference to do so. See MPEP 2143.02 and *In re Mills*, 916 F.2d 680, 16 USPQ 2d 1430. As noted above, there is discussion whatsoever present in Munoz-Garcia that a multi-mode operation even exists let alone is desirable. Applicant submits that even if the antenna array in Munoz-Garcia is capable of being modified to operate in multi-mode operation as disclosed in Garcia, there is no suggestion or motivation for doing so.

As the Examiner has failed to satisfy the necessary criteria for establishing a prima facie case of obviousness with respect to claim 1, for at least the reasons discussed above, Applicant submits that claim 1 patentably distinguishes over the combination of Munoz-Garcia and Gross. It is respectfully submitted that the Examiner reconsider and withdraw the obviousness rejection of claim 1.

Independent claims 15 and 30 recite similar subject matter to claim 1 and for at least the reasons discussed above, Applicant respectfully submits that the claims patentably distinguish over the combination of Munoz-Garcia and Gross and they are allowable.

Dependent claims 2-4, 12, 13, 16 and 32-35 are dependent upon independent claims 1, 15 and 30, either directly or indirectly and Applicant respectfully submits that they are allowable as well.

(ii) Whether claim 5 is unpatentable under 35 U.S.C. §103(a) over Munoz-Garcia and Gross in further view of Jespersen, Pub. No. US 20030236068

Claim 5 is dependent on claim 1. Jespersen does not add anything to Munoz-Garcia and Gross to detract from the arguments above relating to claim 1. Claim 5 is therefore not unpatentable over the combination of Munoz-Garcia, Gross and Jespersen for all of the same reasons given above that claim 1 is not unpatentable over the combination of Munoz-Garcia and Gross.

(iii) whether claim 6 is unpatentable under 35 U.S.C. §103(a) over Munoz-Garcia and Gross in further view of Livingston et al. (hereinafter "Livingston"), U.S. Patent No. 6,388,631

Claim 6 is dependent on claim 1. Livingston does not add anything to Munoz-Garcia and Gross to detract from the arguments above relating to claim 1. Claim 6 is therefore not unpatentable over the combination of Munoz-Garcia, Gross and Livingston for all of the same reasons given above that claim 1 is not unpatentable over the combination of Munoz-Garcia and Gross.

(iv) whether claims 7-11, 14, 17-25, 27 are unpatentable under 35 U.S.C. §103(a) over Munoz-Garcia and Gross, in further view of Kasami

Claims 7-11 and 14 are dependent on claim 1. Kasami does not add anything to Munoz-Garcia and Gross to detract from the arguments above relating to claim 1. Claims 7-11 and 14 are therefore not unpatentable over the combination of Munoz-Garcia, Gross and Kasami for all of the same reasons given above that claim 1 is not unpatentable over the combination of Munoz-Garcia and Gross.

Claims 17-19 are dependent on claim 15. Kasami does not add anything to Munoz-Garcia and Gross to detract from the arguments above relating to claim 15. Claims 17-19 are therefore not unpatentable over the combination of Munoz-Garcia, Gross and Kasami for all of

the same reasons given above that claim 15 is not unpatentable over the combination of Munoz-Garcia and Gross.

Independent claim 20 is a method version of claim 1. Kasami does not add anything to Munoz-Garcia and Gross to detract from the arguments above relating to claim 1. For at least the reasons discussed above, Applicant respectfully submits that claim 20 patentably distinguishes over the combination of Munoz-Garcia, Gross and Kasami.

Claims 21-25 and 27 are dependent on claim 20. Kasami does not add anything to Munoz-Garcia and Gross to detract from the arguments above relating to claim 20. Claims 21-25 and 27 are therefore not unpatentable over the combination of Munoz-Garcia, Gross and Kasami for all of the same reasons given above that claim 20 is not unpatentable over the combination of Munoz-Garcia and Gross.

(v) whether claim 26 is unpatentable under 35 U.S.C. §103(a) over Munoz-Garcia, Gross and Kasami in further view of Yu

Claim 26 is dependent on claim 20. Yu does not add anything to Munoz-Garcia and Gross to detract from the arguments above relating to claim 20. Claim 26 is therefore not unpatentable over the combination of Munoz-Garcia, Gross and Yu for all of the same reasons given above that claim 20 is not unpatentable over the combination of Munoz-Garcia and Gross.

(vi) whether claim 31 is unpatentable under 35 U.S.C. §103(a) over Munoz-Garcia, Gross and Kasami in further view of Berger

Claim 31 is dependent on claim 30. Berger does not add anything to Munoz-Garcia and Gross to detract from the arguments above relating to claim 30. Claim 31 is therefore not unpatentable over the combination of Munoz-Garcia, Gross and Berger for all of the same reasons given above that claim 30 is not unpatentable over the combination of Munoz-Garcia and Gross.

Conclusions

With respect to each of the issues presented herein for review, Applicant respectfully submits that errors have been made in the rejection of the appealed claims.

Regarding the issue of whether claims 1-4, 12-13, 15-16, 30, and 32-35 are unpatentable under 35 U.S.C. §103(a) over Munoz-Garcia in view of Gross, Applicant respectfully requests that the rejection of these claims be reconsidered by the Board and withdrawn.

Regarding the issue of whether claim 5 is unpatentable under 35 U.S.C. §103(a) over Munoz-Garcia and Gross in further view of Jespersen, Applicant respectfully requests that the rejection of this claim be reconsidered by the Board and withdrawn.

Regarding the issue of whether claim 6 is unpatentable under 35 U.S.C. §103(a) over Munoz-Garcia and Gross in further view of Livingston, Applicant respectfully requests that the rejection of this claim be reconsidered by the Board and withdrawn.

Regarding the issue of whether claims 7-11, 14, 17-25, 27 are unpatentable under 35 U.S.C. §103(a) over Munoz-Garcia and Gross, in further view of Kasami, Applicant respectfully requests that the rejection of these claims be reconsidered by the Board and withdrawn.

Regarding the issue of whether claim 26 is unpatentable under 35 U.S.C. §103(a) over Munoz-Garcia, Gross and Kasami in further view of Yu, Applicant respectfully requests that the rejection of this claims be reconsidered by the Board and withdrawn.

Regarding the issue of whether claim 31 is unpatentable under 35 U.S.C. §103(a) over Munoz-Garcia, Gross and Kasami in further view of Berger, Applicant respectfully requests that the rejection of this claims be reconsidered by the Board and withdrawn.

Respectfully submitted,

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Claims Appendix

1. A system for operating an array antenna, the array antenna having a plurality of antenna elements, comprising:

a feeding port;

a plurality of signal shifters for respective connection to the plurality of antenna elements; and

an adaptive beamformer configured to distribute input signals from the feeding port to the plurality of signal shifters and to combine output signals from the plurality of signal shifters for output to the feeding port in a plurality of operating modes, the plurality of operating modes being associated with respective array antenna gain patterns having different beamwidths.

2. The system of claim 1, wherein the adaptive beamformer comprises a plurality of beamformers, each beamformer distributing input signals from the feeding port to, and combining output signals from, particular ones of the plurality of signal shifters.

3. The system of claim 2, wherein the plurality of beamformers comprises a first beamformer for distributing input signals from the feeding port to, and combining output signals from, each of the plurality of signal shifters, and a second beamformer for distributing input signals from the feeding port to, and combining output signals from, a subset of the plurality of signal shifters.

4. The system of claim 3, wherein the subset of the plurality of signal shifters comprises signal shifters for connection to two centre antenna elements of the plurality of antenna elements.

5. The system of claim 2, wherein the adaptive beamformer further comprises an input switch connected to the feeding port and to the plurality of beamformers for switching signals between any one of the plurality of beamformers and the feeding port.

6. The system of claim 3, wherein the adaptive beamformer further comprises:

an input switch connected to the feeding port and to the plurality of beamformers; and

a plurality of switches connected to the first beamformer and the second beamformer and respectively connected to each signal shifter in the subset of the plurality of signal shifters, each of the plurality of switches operable to connect each signal shifter in the subset of the plurality of signal shifters to either the first beamformer or the second beamformer.

7. The system of claim 1, further comprising:

a signal weight calculator configured to calculate signal weights for steering a gain pattern of the array antenna and to output the signal weights to the signal shifters.

8. The system of claim 7, implemented in a network node of a distributed wireless access network, wherein the signal shifters are phase shifters, and wherein the signal weights are phase weights calculated to steer a gain peak in the gain pattern of the array antenna in a direction of a neighbouring network node in the distributed wireless access network.

9. The system of claim 8, wherein the network node further comprises a memory storing a lookup table comprising phase weights for steering the gain peak in the gain pattern of the array antenna in a direction of each neighbouring network node of the network node.

10. The system of claim 7, implemented in a network node of a distributed wireless access network, wherein the signal shifters are combined amplitude and phase shifters, and wherein the signal weights are complex weights comprising amplitude components and phase components calculated based on a location of an interference source in the distributed wireless access network to steer a null in the gain pattern of the array antenna in a direction of the interference source.

11. The system of claim 7, implemented in a network node of a distributed wireless access network, wherein the signal shifters are combined amplitude and phase shifters, and wherein the signal weights are complex weights comprising amplitude components and phase components calculated to steer a null in the gain pattern of the array antenna in a direction of an interference source in the distributed wireless access network and to steer a gain peak in the gain pattern of the array antenna in a direction of a neighbouring network node in the distributed wireless access

network.

12. The system of claim 1, wherein the array antenna comprises a patch array antenna, and wherein the plurality of antenna elements comprises a plurality of columns of radiating elements.

13. The system of claim 1, wherein the plurality of operating modes comprises at least a first operating mode associated with a first array antenna gain pattern having a first beamwidth and a second operating mode associated with a second array antenna gain pattern having a second beamwidth narrower than the first beamwidth.

14. The system of claim 13, implemented in a network node of a distributed wireless access network, the network node having at least one neighbouring network node, wherein the adaptive beamformer operates in the first operating mode to scan for communication requests from the at least one neighbouring node of the network node, and in the second operating mode for communicating with the at least one neighbouring node.

15. A network node for a distributed wireless access network, comprising:

a steerable array antenna having a plurality of antenna elements and configurable beamwidth for establishing wireless transit radio links with neighbouring network nodes in the distributed wireless access network;

a plurality of signal shifters for respective connection to the plurality of antenna elements; and

an adaptive beamformer for distributing array antenna input signals to the plurality of signal shifters and combining array antenna output signals from the plurality of signal shifters in at least a wide beamwidth operating mode associated with an array antenna gain pattern having a first beamwidth and a narrow beamwidth operating mode associated with an array antenna gain pattern having a second beamwidth narrower than the first beamwidth.

16. The network node of claim 15, wherein the adaptive beamformer comprises at least a first beamformer for distributing input signals to and combining output signals from a subset of the plurality of signal shifters in the wide beamwidth operating mode, and a second beamformer

for distributing input signals to and combining output signals from each of the plurality of signal shifters in the narrow beamwidth operating mode.

17. The network node of claim 15, wherein the signal shifters are phase shifters, further comprising:

a phase weight calculator configured to calculate phase weights for steering a gain peak in the array antenna gain pattern having the second beamwidth toward one of the neighbouring nodes, and to output the phase weights to the phase shifters in the narrow beamwidth operating mode.

18. The network node of claim 15, wherein the signal shifters are phase shifters, further comprising:

a complex weight calculator configured to calculate complex weights comprising phase weights and amplitude weights for steering a null in the array antenna gain pattern having the second beamwidth toward an interference source in the distributed wireless access network, and to output the phase weights to the phase shifters and the amplitude weights to the second beamformer in the narrow beamwidth operating mode.

19. The network node of claim 15, wherein the array antenna is operated in the wide beamwidth operating mode during a listening function to scan the neighbouring network nodes and in the narrow beamwidth operating mode during a communication function over a wireless transit radio link.

20. A method of operating an array antenna in a wireless communication network, the array antenna having configurable beamwidth, comprising:

listening for communication requests using a first beamwidth of the array antenna;

receiving a communication request identifying a destination wireless access routing point in the wireless communication network;

forming a beam having a second beamwidth narrower than the first beamwidth;

directing the formed beam toward the destination wireless access routing point; and

transmitting communication signals over the formed beam to the destination wireless access routing point.

21. The method of claim 20, wherein the array antenna comprises a plurality of antenna elements, and listening comprises exciting a subset of the plurality of antenna elements.

22. The method of claim 21, wherein forming comprises exciting each of the plurality of antenna elements.

23. The method of claim 20, wherein directing comprises:

accessing a lookup table to retrieve phase shifts for the plurality of antenna elements to steer the formed beam toward the destination wireless access routing point; and

applying the phase shifts to respective excitation signals of the plurality of antenna elements.

24. The method of claim 22, wherein directing comprises:

calculating phase shifts for the plurality of antenna elements to steer the formed beam toward the destination wireless access routing point; and

applying the phase shifts to respective excitation signals of the plurality of antenna elements.

25. The method of claim 20, further comprising:

determining a location of an interferer; and

directing a null toward the interferer.

26. The method of claim 25, wherein determining a location of an interferer comprises accessing a lookup table to retrieve a bearing angle of the interferer.

27. The method of claim 25, wherein determining a location of an interferer comprises scanning a wireless access area.

28. The method of claim 25, wherein directing a null toward the interferer comprises:

calculating phase shifts and amplitude shifts for the plurality of antenna elements to steer the null toward the interferer; and

applying the phase shifts and the amplitude shifts to respective excitation signals of the plurality of antenna elements.

29. A system for operating an array antenna element in a wireless communication network, comprising:

means for exciting the array antenna to form a beam having a first beamwidth to listen for communication requests;

means for receiving a communication request identifying a destination wireless access routing point in the wireless communication network;

means for exciting the array antenna to form a beam having a second beamwidth narrower than the first beamwidth, and for directing the formed beam toward the destination wireless access routing point; and

means for transmitting communication signals over the beam having the second beamwidth to the destination wireless access routing point.

30. A distributed wireless access network, comprising:

a plurality of network access nodes; and

a plurality of wireless transit radio links between the network access nodes,

wherein at least one of the network access nodes comprises an electronically steerable high gain array antenna with configurable beamwidth for establishing wireless transit links with neighbouring network access nodes.

31. The network of claim 30, wherein at least one of the network access nodes is connected to a broadband wireline backbone connection.

32. The network of claim 30, wherein the beamwidth of the array antenna is controlled by different excitations of the array antenna.

33. The network of claim 30, wherein the array antenna comprises a plurality of diversity transceivers.

34. The network of claim 33, wherein the diversity transceivers are dual polarized diversity transceivers, and wherein beams for each polarization direction of the diversity transceivers are steered independently.

35. The network of claim 30, wherein the beamwidth of the array antenna is configurable to provide decreased probability of interference.

Evidence Appendix

Nonc

Appl. No. 10/116,054

Related Proceedings Appendix

None